

# MATH 220: MATRICES

PENN STATE UNIVERSITY – UNIVERSITY PARK  
FALL 2011 SYLLABUS

**Course Web Page:**

<http://www.leet.it/people/mazzu/math220/>

**Course Description:**

Systems of linear equations; matrix algebra; eigenvalues and eigenvectors; orthogonality and least squares; symmetric matrices and quadratic forms.

**Prerequisite:**

MATH 110 or MATH 140.

**Text Book:**

*Linear Algebra and its Applications* by David Lay, fourth edition, Pearson.

**Instructor:**

Professor Marco Mazzucchelli

**Office:** 405 McAllister Building

**Email:** [math220psu@gmail.com](mailto:math220psu@gmail.com)

**Office hours:** Thursday 5:00pm – 8:00pm.

**Homework:**

Homework is to be handed in on time, stapled and legible. Make sure to write your name, PSU email id and section number on the front page. Late homework will not be graded for any (even good) reason. Homework is due on **Tuesday at the beginning of your class**. The 10 best homework scores will be counted toward the final grade.

The homeworks are essential in learning linear algebra. They are not a test, and you are encouraged to talk to other students about difficult problems after you have found them to be difficult. However, you must write your own solutions.

**Calculators:**

The use of calculators is not permitted on exams. Calculators may be used (but are not necessary) on homework assignments.

**Midterm:**

A 75 minute evening exam will be held on **Wednesday, October 12, 2011, from 6:30pm to 7:45 pm**. Students must bring their ID cards to all exams.

**Conflict and Makeup Midterm Exams:**

Only students with official University conflicts will be allowed to schedule the conflict exam. Only students with a valid, documented excuse will be permitted to schedule the makeup exam with no penalty. Students without a valid, documented excuse may be allowed to take a makeup exam, but they will receive a mandatory 20-point deduction on their scores.

The conflict exam is at 5:05pm to 6:20pm on Wednesday, October 12, 2011. Students taking the conflict exam are not allowed to leave the examination room until 6:25pm. Any student who leaves the room before 6:25pm will receive a score of zero on the exam and will not be allowed to retake it.

You must sign up for the conflict exam in class, with your instructor, on a pink form. You are responsible for knowing the room and time of the conflict exam. This information is on the top of the pink form. Note that your instructor must turn in the pink form 48 hours prior to the examination date. If you have not signed up with your instructor, you will not be allowed to take the conflict exam.

For the makeup exam, you must sign up with your instructor, on a yellow form, as soon as possible following the regular exam date.

**Final Exam:**

A comprehensive final exam, covering all aspects of the course, will be given during the final examination period, which is 12 – 16 December. **Students must not make plans to leave University Park before Saturday, Dec 17.** Students must bring their ID cards to all exams.

**Conflict and Makeup Final Exams:**

For the final exam, notification of conflicts is given on the student's final exam schedule on e-Lion. A student must take action to request a conflict exam through e-Lion during the period September 26 – October 16. Note that the conflict final exam is scheduled by the Registrar's office, not by the Department of Mathematics.

Students who miss both the regular and the conflict final exams due to a valid and documented reason may be allowed to take a makeup final exam. If a student does not have a valid reason, a 30-point penalty will be imposed. All such makeup exams must be scheduled through the instructor, and students must contact the instructor within 24 hours of the final exam.

**Grading Policy:**

Grades will be assigned on the basis of 350 points distributed as follows:

100 points for homework,  
100 points for the midterm exam,  
150 points for the final exam.

Final grades will be assigned as follows:

<b>A</b>	325 to 350
<b>A-</b>	315 to 324
<b>B+</b>	304 to 314
<b>B</b>	290 to 303
<b>B-</b>	280 to 289
<b>C+</b>	269 to 279
<b>C</b>	245 to 268
<b>D</b>	210 to 244
<b>F</b>	0 to 209.

NOTE! We do not use a “curve” in this course. Grades will be based exclusively on homework, the midterm exam, and the final exam. There is no “extra-credit” work for this course.

**Academic Integrity:**

During exams, the use of books, calculators, or notes of any sort is not permitted, and communicating with anyone or copying anything from anyone is not permitted. Cell phones must be turned OFF. Also see

<http://www.science.psu.edu/academic/Integrity/>.

**Tutors and Math Center:**

Free mathematics tutoring is available at Penn State Learning

<http://www.PennStateLearning.psu.edu>

located in 7 Sparks Building, starting 29 Aug. They are open Sun-Thur, during 6pm-10pm.

If you need additional help from (paid) tutors, a list is maintained in the Mathematics Department Undergraduate Office in 104 McAllister Building. It is available online through Undergraduate Studies link on the Mathematics homepage, at

<http://www.math.psu.edu/ug/>

(click on “courses”). This website is a good source for general information about undergraduate mathematics as well as information on evening exam schedules, office hours for instructors, and so on.

**Questions, Problems, Comments:**

If you have questions or concerns about a grade or course-related issue regarding Math 220, please consult your instructor first. If this does not result in a satisfactory solution, please consult the course coordinator, Diane Henderson, [dmh@math.psu.edu](mailto:dmh@math.psu.edu). If you still cannot resolve the problem,

please consult the Associate Head for Undergraduate Studies, James Sellers ([sellersj@math.psu.edu](mailto:sellersj@math.psu.edu)).

**Course Outline:**

(Timing is subject to change. The number after each section is the approximate number of class periods.)

1. LINEAR EQUATIONS IN LINEAR ALGEBRA
  - 1.1 Systems of Linear Equations (1.5)
  - 1.2 Row Reduction and Echelon Forms (1.5)
  - 1.3 Vector Equations (1.5)
  - 1.4 The Matrix Equation  $\mathbf{Ax} = \mathbf{b}$  (1)
  - 1.5 Solution Sets of Linear Systems (1)
  - 1.7 Linear Independence (1)
  - 1.8 Introduction to Linear Transformations (1)
  - 1.9 The Matrix of a Linear Transformation (1)
  
2. MATRIX ALGEBRA
  - 2.1 Matrix Operations (1)
  - 2.2 The Inverse of a Matrix (1)
  - 2.3 Characterizations of Invertible Matrices (1)
  - 2.8 Subspaces of  $\mathbf{R}^n$  (1.5)Review for Midterm Exam (1)
  - 2.9 Dimensions and Rank (1.5)
  
3. DETERMINANTS
  - 3.1 Introduction to Determinants (1)
  - 3.2 Properties of the Determinants plus Cramer's rule from 3.3 (1)
  
5. EIGENPROBLEMS
  - 5.1 Eigenvalues and Eigenvectors (2)
  - 5.2 The Characteristic Equation (1)
  - 5.3 Diagonalization (1)
  
6. ORTHOGONALITY AND LEAST SQUARES
  - 6.1 Inner Product, Length, and Orthogonality (0.5)
  - 6.2 Orthogonal Sets (1)
  - 6.3 Orthogonal Projections (1)
  - 6.4 The Gram-Schmidt Process (no QR Factorization) (1)
  - 6.5 Least-Squares Problems, Example 1 from 6.6 (1)
  
7. SYMMETRIC MATRICES
  - 7.1 Diagonalization of Symmetric Matrices, Spectral Theorem (1)
  - 7.2 Quadratic Forms (1)Review for Final Exam (1)